SEVENTH GRADE MATHEMATICS

GRADE LEVEL CONTENT EXPECTATIONS

7 MATH

v.4.04

NUMBER & OPERATIONS

ALGEBRA

MEASUREMENT

GEOMETRY

DATA & PROBABILITY

Welcome to a preview of Michigan's mathematical future! This document not only introduces Michigan's new Grade Level Content Expectations for mathematics, it also establishes high expectations in mathematics to better prepare all K-12 Michigan students for the challenges of the future.

Creating grade-level expectations involves a complex combination of understanding of mathematics, curriculum, student learning, teaching, current practices, and policy. Curriculum directors, mathematics educators, and classroom teachers from Michigan school districts across the state, together with mathematics and mathematics education faculty from universities across the state, have been involved in the development and/or review of the **Michigan Mathematics Grade Level Content Expectations.** The GLCE are intended to be usable as a framework for the development of grade-by-grade assessments, and to provide teachers with a guide for their instructional and curricular emphases in classrooms. The expectations were constructed to feature continuity from one grade to the next, and to ensure coherence both mathematically and pedagogically. These expectations represent a challenge toward which to aspire; in some cases, teachers and mathematics educators will be called on to move beyond their current practice and experience into territory that will be both demanding and rewarding. Michigan students can rise to the challenge of high academic standards. This document provides a set of ambitious goals for all of us.

This document is intended to be an assessment tool. This means students will be expected to be proficient in the concepts and skills included in this document at the end of the indicated grade level. These expectations are written to convey intended performances by students. The expectations here generally represent key landmarks in mathematics learning — areas where students are expected to have consolidated their understandings and skills. Thus it does not attempt to elaborate all of the precursor ideas and concepts that lead to a particular expectation in a particular grade level — it instead assumes that teachers will build up to the expectations through exploration and development of concepts and processes

The Grade Level Content Expectations are not designed to be a curriculum document, or to function as a scope and sequence framework. It is not designed to suggest the various pedagogical options and strategies that might best enable students to attain these expectations. Rather, it should serve as a basis for the development of a curriculum and instructional strategies that would help the students attain the concepts and skills necessary to meet the GLCE. Various groups are being organized

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to develop clarification documents, content examples, more elaborated explanations, and suggestions for professional development that would support these expectations. Ultimately, teachers, school personnel and district leaders will need to collaborate and draw on their own professional wisdom and experience, as well as on research, to decide how best to organize instruction to help their students meet these expectations.

The mathematics content expectations have been organized into five strands: Number and Operations, Algebra, Geometry, Measurement, and Data and Probability.

These expectations are being presented in two formats; one designed to show specific grade level expectations and a second to show how the expectations transition from one grade level to the next. In the **grade level** format the expectations are organized first by the five strands. Each of the strands is then broken down into content pieces titled "Topics" in an attempt to cluster related ideas for teaching continuity. Under each "Topic" are listed the expectations.

The second format is a "**cross-grade**" version, which has been designed with the intent that one grade level can be easily compared with another and to highlight the mathematical growth that is envisioned across the grades. This format also has been organized into the five strands. However, each strand has been subdivided into broader, more conceptual groupings called "Domains," to allow for cross grade comparison of the expectations. In several of the strands, the "domains" are similar to the "standards" in *Principles and Standards for School Mathematics* from the National Council of Teachers of Mathematics. In the "cross-grade" version, some key expectations are "cross-listed" in grey when they seem especially crucial to the development of another strand. For instance, several strands from the Number and Operations strand are also listed in grey in the Algebra strand.

Although this organization does not include what have typically been called "process" strands, the importance of mathematical process in the development of these proficiencies cannot be underestimated. Embedded within these expectations are emphases on representation, problem solving, and reasoning as appropriate. The importance of making mathematical connections is conveyed through the cross listing. Finally, the process of communication is foundational to all of mathematics learning.

With the cooperation of all those involved in the education of Michigan students, we can enable our young people to attain the highest standards – and thereby open doors for them to have fulfilling and successful lives in a quantitatively and technologically complex future.

SEVENTH GRADE

The main focus in grade seven is the algebra concept of linear relationships including ideas about proportional relationships. Students should understand the relationship of equations to their graphs, as well as to tables and contextual situations for linear functions. In addition, work in algebra extends into simplifying and solving simple expressions and equations. The main concept from geometry in grade seven is similarity of polygons which also draws on ideas about proportion. Students apply their understanding of ratio in data-based situations.

NUMBER AND OPERATIONS

Understand derived quantities

N.ME.07.01 Understand derived quantities such as density, velocity, and weighted averages.

N.FL.07.02 Solve problems involving derived quantities.

Understand and solve problems involving rates, ratios, and proportions

N.FL.07.03 Calculate rates of change including speed.

N.MR.07.04 Convert ratio quantities between different systems of units such as feet per second to miles per hour.

N.FL.07.05 Solve simple proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation a/b = c/d; know how to see patterns about proportional situations in tables.

Recognize irrational numbers

N.MR.07.06 Understand the concept of square root and cube root, and estimate using calculators.

Compute with rational numbers

N.FL.07.07 Solve problems involving operations with integers.

N.FL.07.08 Add, subtract, multiply and divide negative rational numbers.

N.FL.07.09 Estimate results of computations with rational numbers.

ALGEBRA

Understand and apply directly proportional relationships and relate to linear relationships

A.PA.07.01 Recognize when information given in a table, graph, or formula suggests a proportional or linear relationship.

A.RP.07.02 Represent directly proportional and linear relationships using verbal descriptions, tables, graphs, and formulas, and translate among these representations.

A.PA.07.03 Given a directly proportional or linear situation, graph and interpret the slope and intercept(s) in terms of the original situation; evaluate $y = kx$ for specific x values, given k, e.g., weight vs. volume of water, base cost plus cost per unit.

A.PA.07.04 For directly proportional or linear situations, solve applied problems using graphs and equations, e.g., the heights and volume of a container with uniform cross-section, height of water in a tank being filled at a constant rate, degrees Celsius and degrees Fahrenheit, distance and time under constant speed.

A.PA.07.05 Understand and use directly proportional relationships of the form $y = mx$, and distinguish from linear relationships of the form $y = mx + b$, b non-zero; understand that in a directly proportional relationship between two quantities one quantity is a constant multiple of the other quantity.

Understand and represent linear functions

A.PA.07.06 Calculate the slope from the graph of a linear function as the ratio of "rise/run" for a pair of points on the graph, and express the answer as a fraction and a decimal; understand that linear functions have slope that is a constant rate of change.

A.PA.07.07 Represent linear functions in the form $y = x + b$, $y = mx$, and $y = mx + b$, and graph, interpreting slope and y-intercept.

A.FO.07.08 Know that the solution to a linear equation corresponds to the point at which its graph crosses the x-axis.

Understand and solve problems about inversely proportional relationships

A.PA.07.09 Recognize inversely proportional relationships in contextual situations; know that quantities are inversely proportional if their product is constant, e.g., the length and width of a rectangle with fixed area, and that an inversely proportional relationship is of the form $y = k/x$ where k is some non-zero number.

A.RP.07.10 Know that the graph of $y = k/x$ is not a line; know its shape; and know that it crosses neither the x nor the y-axis.

Apply basic properties of real numbers in algebraic contexts

A.PA.07.11 Understand and use basic properties of real numbers: additive and multiplicative identities, additive and multiplicative inverses, commutativity, associativity, and the distributive property of multiplication over addition.

Combine algebraic expressions and solve equations

A.FO.07.12 Add, subtract, and multiply simple algebraic expressions of the first degree, e.g., $(92x + 8y) – 5x + y$, or $– 2x (5x – 4)$, and justify using properties of real numbers.

A.FO.07.13 From applied situations, generate and solve linear equations of the form $ax + b = c$ and $ax + b = cx + d$, and interpret solutions.

GEOMETRY

Draw and construct geometric objects

G.SR.07.01 Use a ruler and other tools to draw squares, rectangles, triangles and parallelograms with specified dimensions.

G.SR.07.02 Use compass and straightedge to perform basic geometric constructions: the perpendicular bisector of a segment, an equilateral triangle, and the bisector of an angle; understand informal justifications.

Understand the concept of similar polygons, and solve related problems

G.TR.07.03 Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal; understand the concepts of similar figures and scale factor.

G.TR.07.04 Solve problems about similar figures and scale drawings.

G.TR.07.05 Show that two triangles are similar using the criteria: corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of all pairs of corresponding sides are equal (SSS similarity); use these criteria to solve problems and to justify arguments.

G.TR.07.06 Understand and use the fact that when two triangles are similar with scale factor of r, their areas are related by a factor of r^2.

Data and Probability

Represent data and interpret

D.RE.07.01 Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address specific questions.

D.AN.07.02 Create and interpret scatter plots and find line of best fit and use an estimated line of best fit to answer questions about the data.

Compute statistics about datasets

D.AN.07.03 Calculate and interpret relative frequencies and cumulative frequencies for given data sets.

D.AN.07.04 Find and interpret the median, quartiles, and interquartile range of a given set of data.